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Evaluation of Local Multi-Criteria of Stony-Cement Corrective Dams Construction in Watershed Sub-Basin of Golpayegan by Fuzzy and Boolean Method, Isfahan, Iran

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ABSTRACT

Water and soil are the most important natural sources that play important role in forming and surviving of civilization. In this case of study, checking out of water and soil sources is so important. This sources have been damaged by human's intervention that can be problematic in continuation of human's life. Purpose of this research is checking out suitable place to construct the corrective dam through the waterways in order to decrease erosion, sediment and its destructive effects. This, however, needs the identification of defenseless zones to soil erosion. Because of the complex interactions between the diverse mechanisms that govern soil erosion and the inherent uncertainties involved in measuring these procedures, evaluating erosion defenselessness at the watershed scale is stimulating. In this research, intended layers have been prepared in ARC GIS software. In tree model that was provided in ILWIS, local and economic factors and limitations have been considered. Map of factors and limitation has been standardized, weight of each data layer has been given with Fuzzy and Boolean method according to view of expert. Eventually with combining layers of final maps, that show local prioritize for constructing stony-cement dams through the waterway. Conclusion show, SMCE method is used for locating.

Keywords: *Corrective Dams, Local Multi-Criteria's Evaluating, Golpayegan, Stony-Cement Dams*

INTRODUCTION

In engineering organization control, anthropological beings can play numerous key roles, in actual concerning measurement, global valuation and conclusion. One of dangers that threaten water and soil sources is soil drifting and sediment. Aggregate breakdown affects the accessibility of soil elements for size-selective sediment transport with surface runoff during erosive rainfall events. Organic material administration is known to affect aggregate permanency against breakdown, but little is known about how this translates into rainfall-induced aggregate fragmentation and sediment transport underground environments.

Soil drifting as a factor of environment destruction, causes to not only destroy soil and reduction of soil's productivity, but also pollute the surface water sources and reduction of water penetrating into the soil that lead to forest and grassland destruction, vegetation reduction, decreasing of underground water reservoir's nutrition and expedition in desertification. Pollutants that are aggregated with sediments, especially fine aggregate in tanks of dams, lakes, wetlands and floors of the river, are considered a dangerous for the future. [1] One of the simple methods to control flood and reduce the damages of flood in waterways of watershed is constructing corrective dams. Most of the corrective lines are filled with coarse and varying aggregate, Sediments that have low chance of reaching to behind the reservoir dams of downstream. Therefore, investigation of these structures' function in maintaining sediments fine aggregate seemed necessary. Corrective dams or sediment taker dams are small structures that are leaded to restraining sediments and reducing erosion in waterways by decreasing gradient of waterway and speed of water's flow [2] and are leaded to correcting longitudinal profile of waterways and because of that, these kinds of structures repute as corrective dams. [1] These structures are considered one of the main tools in watershed activities for protecting water and soil those have been used by executive (؟doubt)organs in wide range in recent years and assigned the major part of expenditures to its own, but in spite of whole struggles and investment in this part, main difficulties, that's mean erosion and natural sources destruction are increasing and according to field evidence and done studies, investigation of type and grading of sediments and how they transferred in water can be rate of their efficacy in sediments reduction that eventually transferred to tanks of dams, are guidance for choosing the place of corrective lines[3]. Since that waterways No. 4 and 3 are investigating for locating corrective dams, stony-cement dams have known more suitable. Golpayegan is a mountainous are. Golpayegan's plain is wide and its water is supplied from river, subterranean, fountain and groundwater's sources. Central mountains of Iran cross from this county. Esmaeil Namaghi and his colleagues can be named as people who have done a lot of study in corrective dam field that have investigated Khoshke chin dam in Doroudzan dam. Reason of inappropriate choosing of limit gradient is upstream corrective dams that have been buried in sediment in behind of downstream corrective dams. If space between corrective dams chose according to limit gradient, it would lead to reduction of corrective dams' build's cost. Ghazavi et al investigated effects of corrective dams on morphology of waterway and effects of sediment in watershed of Abjavan in Fars province. They concluded that function of corrective dams in different parts through the waterway in trapping fine aggregate sediments is more than mirage. Xiang Zhou et al, through their study that they had in yellow river, said corrective dams are the most effective method to decrease quickly coarse aggregate sediments that entered in yellow river. According to in dry weather and poor soil of plain in china, organizing corrective dams in gutter is the most effective method for protecting soil.

AREA OF STUDY

Golpayegan limited to Khomein in north, Bakhtiyari and Aligoudarz Mountains in west, Khansar and Bakhtiyari Mountains in south, Meime and Sheikh Ahmed Mountain and Sorkh Mountain and Saleh peighambar and Mahour gol galleh in east and Najafabad in southeast. Its height from sea level is 1818 meter. (Basis of height is average level of Persian Gulf's water in Faw area that is basis of European levels). Weather of Golpayegan is variable and has cold winter with minimum temperature of -21 degrees and warm and dry summers that maximum temperature is +37.5 degrees. Longitude of this area is 33 degrees 02 minutes and 03 seconds and latitude is 50 degree 20 minutes and 17 seconds west. Rainfall is in winter mostly and its rate approximately is 300 millimeters. Golpayegan is a mountainous area.

According to census report in 1385, population of Golpayegan County were 86601 people (24820 households). This county has three rural districts (Jolgeh, Kenar roudkhane, Nivan), three towns (Golpayegan, Gouged and Golshahr) and 52 villages. Villages in area of study are Darrebid, Doshakhrat and Baba Mohammad castle. Heights of Golpayegan County those are east sequence of Zagros Mountains and mostly are separated from mountains in around the Isfahan, belong to second geological period and stretch from northeast to southeast in form of several parallel branches. The highest summit of this county is Prophet Saleh Mountain that shrine is on its summit. River of Golpayegan that stems from heights of Zagros beside of Zayandehroud branches, is the main drainage network of area.

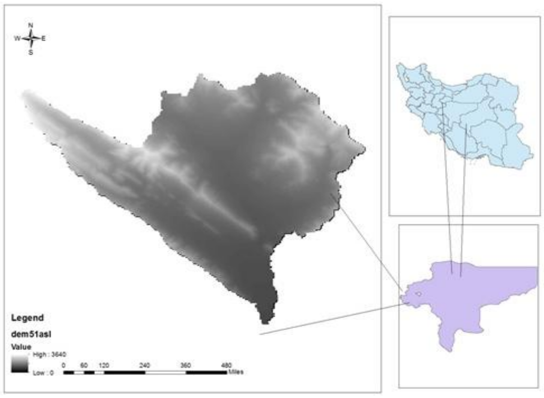

Figure1. *Location of area of study*

MATERIALS AND METHODS

Layers of interest in ARCMAP software have same coordinate system. At first, layers of interest have been converted to CGS and then have been returned to UTM. Maps of limitation and factors in tree model in SMCE that have been provided in ILWIS software. Classification map of making these corrective lines was obtained. Totally using of this type of modeling and utilization of decision rules cause to saving time and money and more accurate locating. In figure 3, used information layers for locating of stony-cement corrective dams illustrated. As we see in table 3, limitations weighted in Bullet method to delete incompatible factors. Factors group weighted between one and zero based on rate of their importance for building stony-cement corrective dams. For example, geology of area with weighting rates method has been given in the way that weak stone because of less resistance versus erosion has higher rank and any stone that is harder has lower rank.

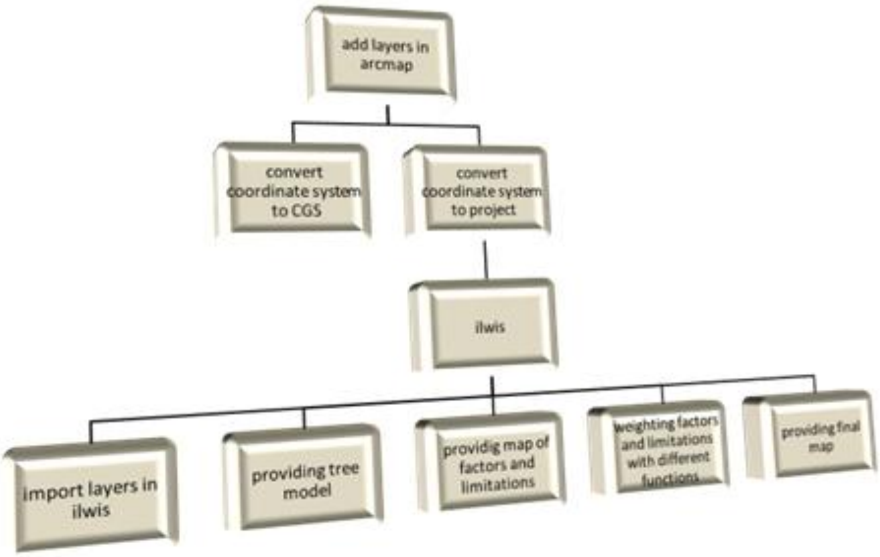

Figure2. *Process in ILWIS and ARCMAP software*

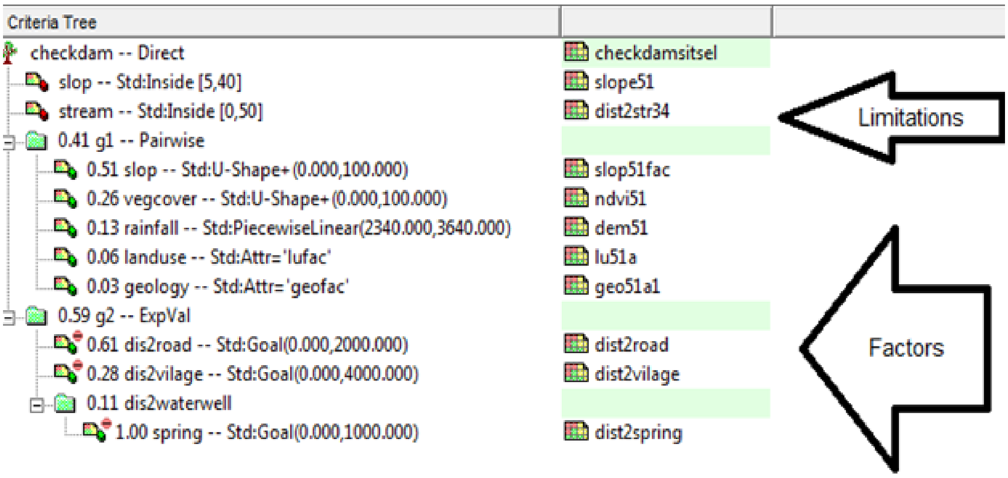

Figure3. *Tree model of location factors and economic and limitations*

Table1. *Factors and limitations*

Value	Weighting	Reason	Function	Map	Standard
	Boolean (zero and one)	Where water is one and others take zero	Consider equal to pixel size	Waterway	Limitation
		Average gradient because erosion and sediment are less than much gradient and less	Boolean function give one to 5-40 gradients and give others zero	Gradient	

.51	Paired comparison	High gradient is more suitable because of high erosion	Standard(high gradient take high value)	Gradient	Factors
0/03		Weak stone get into more erosion	By rank(weak stone takes high rank and hard stone takes lower one)	Geology	
0/ 06		Estate that have proprietor, have less economic value and aren't appropriate for building dam and take lower rank	By rank	User of lands	
0.26		If vegetation was inappropriate, building dam would be needed because of more erosion	By rank	Vegetation	
0.13		Rainfall causes to more erosion	Standard (heights take higher rank because of rainfall)	Rainfall	
0.61	Rank ordering	Being near to road has economic efficiency	By rank (being near to village has more value)		
0.28		Because of providing people, being near to village has more value	By rank (being near to village has more value)	Village	
0.11	Direct method ranking	Because of economic value of fountain, being near to it has more value	Standard (being near to fountain has more value)	Fountain	

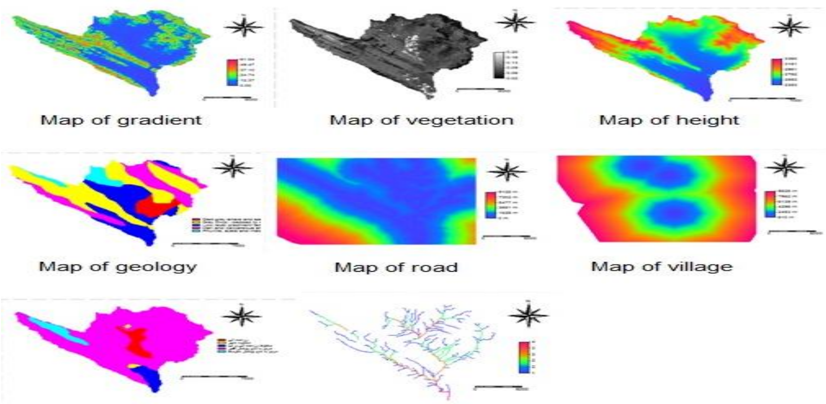

Figure4. *Limitations and economic and location factors*

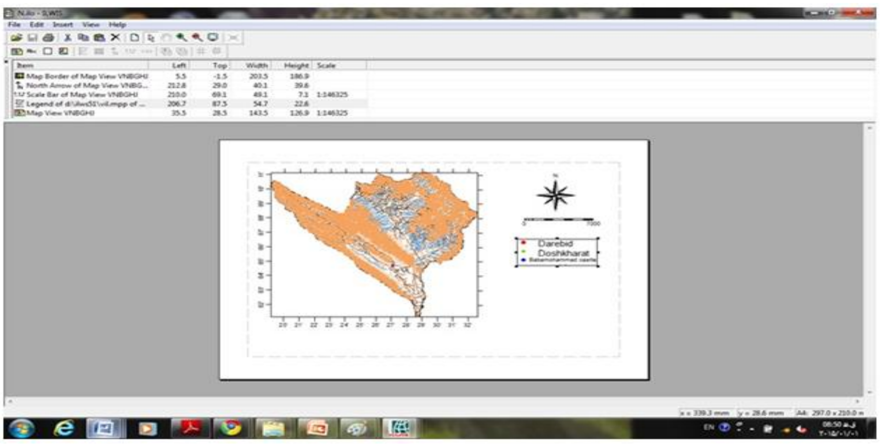

Figure5. *Map of Watershed*

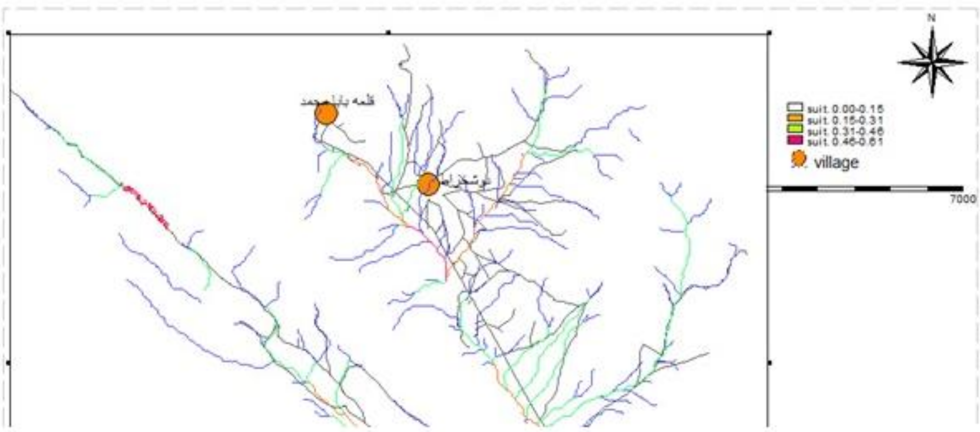

Figure6. *Prioritized Areas for Building Stony-Cement Dams*

Conclusion

In this research, prioritized areas for building stony-cement corrective dams determined (figure5). From experts who work in this field, study that was about investigation of Khoshke chin dams in sequestration of sediments in Tang-e-Darab can mentioned that shows acceptable function of these dams in sequestration of fine aggregate sediments. In the other research, according to role of corrective dams in controlling sediments of watershed of Taham dam in Zanjan province that shows difference of sediment rate in different watershed. Select the desired criterion was based on expert's opinion. In provided tree model, economic factors such as distance from village and distance from road have more important in compare with natural factors. According to weighting and compilation of factors and limitations, prioritized locations for building stony-cement dams have been determined in figure 6.

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